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STUDY ON DISCRETE MATHEMATICS SETS.

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***Abstract*- This paper address about the sets, the types of sets and the basic operations that is performed on sets.**

I. INTRODUCTION

In mathematics a set is a collection of distinct objects. When objects considered separately, they are distinct, but when they are considered collectively they form a single set. Sets are one of the most fundamental concepts in mathematics. Developed at the end of the 19th century, set theory is now a ubiquitous part of mathematics, and can be used as a foundation from which nearly all of mathematics can be derived. The objects that make up

a set can be anything: numbers, people, letters of the alphabet, other sets, and so on Georg Cantor is the founder of set theory. A set is a gathering together into a whole of definite, distinct objects of our perception or of our thought—which are called elements of the set. Sets are conventionally denoted with capital letters. Sets A and B are equal if and only if they have precisely the same elements

II. SET FORMATION

The set can be formed in two ways:

a) Tabular form of sets.

b) Builder form of sets.

- **Tabular form:**

If set is defined by actually listing its members then it is expressed as P={2,4,6,7}.

This is called the tabular form of sets

- **Builder form of sets:**
  Is a set is defined by the properties which its element must satisfy then the set is said to be in builder form of sets.
  Eg: P={x:x €N,x is a multiple of 3}

III. STANDARD NOTATIONS

Ø- EMPTY SET
U - UNIVERSAL SET
N - The set of all natural number
I - The set of all integers
Io - The set of all non-zero integers
I+ - The set of all positive integers
C,Co - The set of all complex, non-complex number complex respectively
Q,Qo,Q+ - The set of rational ,non-zero real ,positive rational number
R,Ro,R+ - The set of real ,non-zero real, positive real number respectively

IV. MEMBERSHIP

If *a* is a member of *B*, this is denoted $a \in B$
While if *c* is not a member of *B* then $c \notin B$.

V. CARDINALITY OF SETS

The cardinality $|S|$ of a set *S* is "the number of members of *S*." For example, if *B* = {*blue*, *white*, *red*}, $|B| = 3$.

There is a unique set with no members and zero cardinality, which is called the*empty set* (or the *null set*) and is denoted by the symbol Ø .

TYPES OF SETS

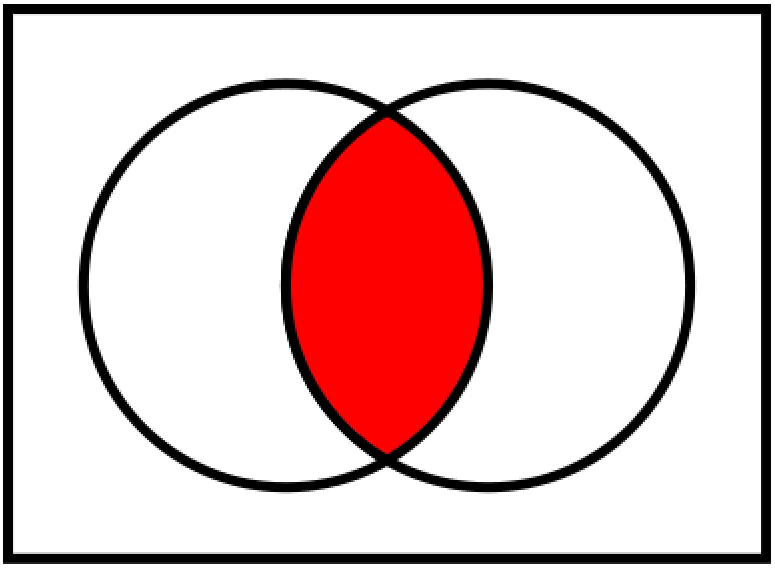
1.)FINITE SET:

If a set consist of specific number of different element then that set is called finite set
Eg:P=**{** x:x €N,3<x<11**}**

2.) INFINITE SET:

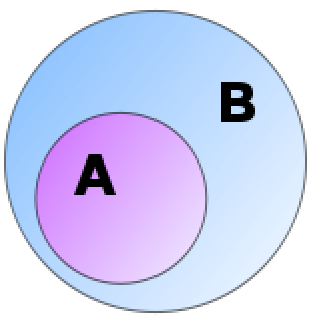
If a set consist of infinite number of different element or if the counting of different element of sets does not come to an end ,the set is called infinite set.
Eg: I={the set of integer}.

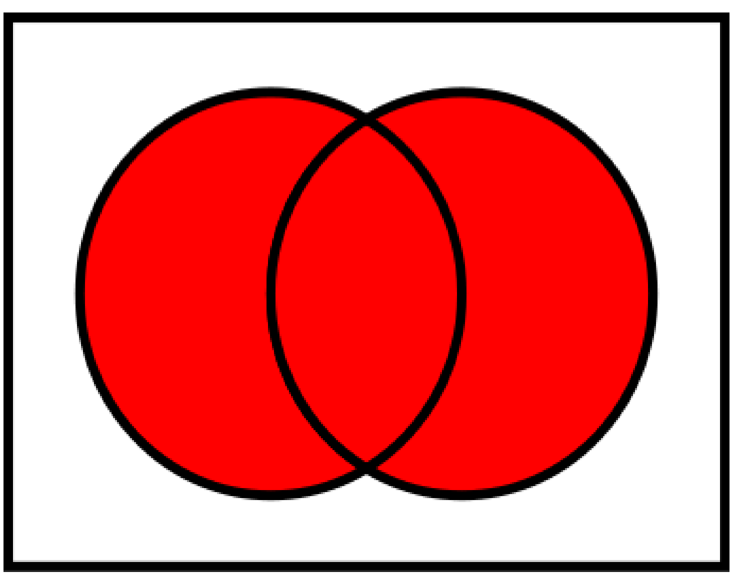
3.) SUBSET:



If every member of set *A* is also a member of set *B*, then *A* is said to be a *subset* of *B*

This can be illustrated through vendiagram(ven diagram are the graphical way to represent sets)





4.) POWER SETS:

The power set of any given set A is the set of all the subset of A and is denoted by P(A) For example, the power set of the set {1, 2, 3} is {{1, 2, 3}, {1, 2}, {1, 3}, {2, 3}, {1}, {2}, {3}, ∅}.

- **BASIC OPERATINS ON SETS**

1.) UNIONS

Two sets can be "added" together. The *union* of *A* and *B*, denoted by *A* ∪ *B*, is the set of all things that are members of either *A* or *B*.

Examples:

- {1, 2} ∪ {1, 2} = {1, 2}.
- {1, 2} ∪ {2, 3} = {1, 2, 3}.
- {1, 2, 3} ∪ {3, 4, 5} = {1, 2, 3, 4, 5}.

A∪B

Some basic properties of unions:

- *A* ∪ *B* = *B* ∪ *A*.
- *A* ∪ (*B* ∪ *C*) = (*A* ∪ *B*) ∪ *C*.
- *A* ⊆ (*A* ∪ *B*).
- *A* ∪ *A* = *A*.
- *A* ∪∅ = *A*.

1.) INTERSECTION

A new set can also be constructed by determining which members two sets have "in common". The *intersection* of *A* and *B*, denoted by *A* ∩ *B*, is the set of all things that are members of both *A* and *B*.

Examples:

- {1, 2} ∩ {1, 2} = {1, 2}.
- {1, 2} ∩ {2, 3} = {2}.

A∩B

Some basic properties of intersections:

- *A* ∩ *B* = *B* ∩ *A*.
- *A* ∩ (*B* ∩ *C*) = (*A* ∩ *B*) ∩ *C*.
- *A* ∩ *B* ⊆ *A*.
- *A* ∩ *A* = *A*.
- *A* ∩ ∅ = ∅.

VI. COMPLEMENT

Two sets can also be "subtracted". The *relative complement* o *A* (also called the *set-theoretic difference* of *A* denoted by $U - A$ is

Examples:

- {1, 2} - {1, 2} = ∅.
- {1, 2, 3, 4} - {1, 3} = {2, 4}.

A-B

De MORGAN'S LAW FOR SETS:

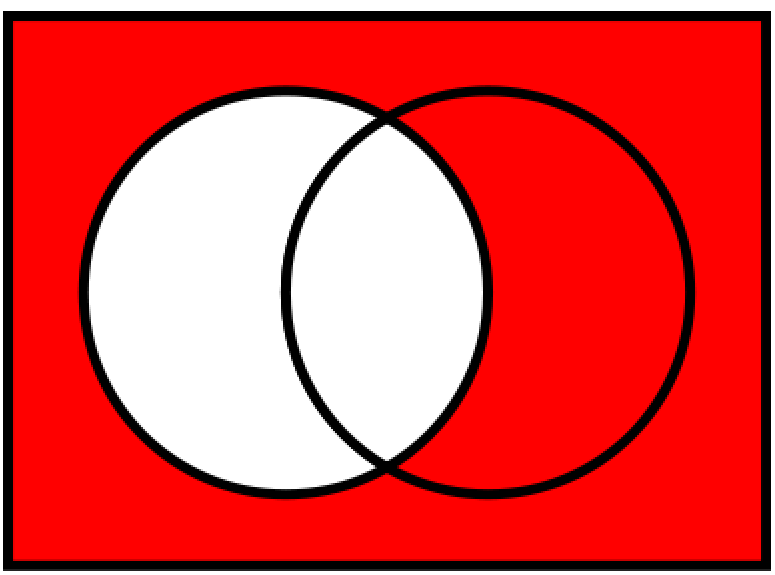
- **(A ∪ B)′ = A′ ∩ B′**
- **(A ∩ B)′ = A′ ∪ B′**

REFERENCE

1) BOOK: DISCRETE STRUCTURE MATHEMATICS BY SATINDER BAL GUPTA

2) www.google.com

3) www.Wikipedia.org



the set of all elements that are members of U but not members of *A*. Here U is the universal set.